

A REVIEW OF THE SPIDER GENUS *THIODINA* (ARANEAE, SALTICIDAE) IN THE UNITED STATES

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ABSTRACT. The jumping spider genus *Thiodina* in the United States is reviewed here and the common western species, *T. hespera* new species, is formally described for the first time. We present a species key for specimens north of Mexico.

Keywords: Taxonomy, new species, North America

The jumping spider genus *Thiodina* is common throughout much of the southern United States extending south into Argentina. Eighteen species are known (Platnick 2003). Hentz (1846) described two species from the eastern United States, *T. sylvana* and *T. puerpera*, the type specimens of which no longer exist. At least one undescribed species is known from the western United States. The purpose of the current work is to describe this western species, to review the other two described species, and to provide a key to differentiate them.

Wolff (1985) produced a full revision of the North American (including Mexican) species of *Thiodina*. Unfortunately, that work was never published and the western species was referred to only as *Thiodina* new species A. Because this lack of a proper description and name is not likely to change, we felt that it was necessary to rectify this situation.

We have not included the tropical American fauna because the species in Mexico and Central and South America require further study and would need a much broader effort. There are also fewer specimens available and the inter- and intraspecific genitalic differences are not always sufficiently diagnostic to allow for a description of new species without a large number of specimens for comparison. Future study should include the Central and South American species as well, as some of these may range into southern Mexico. Wolff (1985) did study the fauna of Mexico through

Central America and found no described species from this area matching the new species we describe here. He did include two undescribed species (*Thiodina* sp. B and sp. C) from Panama, and Oaxaca, respectively, which are not the species in question. Pires de Melo Nogueira (2003) recently revised the species of *Thiodina* from Brazil. Comparison of our species with the illustrations of seven species included in her thesis (including one undescribed) produced no close matches. Four other species were eliminated because three are probable synonyms of other species covered and the other is represented by an immature female type. Two other species (*T. sylvana* and *T. puerpera*) are included in the current work. *Thiodina crucifera* (Cambridge 1901) does not appear to be the same, based on the epigynal illustration. Thus 13 of the 18 described species and three undescribed species have been eliminated from consideration. The remaining 5 species are *T. branicki* (Taczanowski) from northern South America, *T. cockerelli* (Peckham & Peckham) from Hispaniola and Jamaica, *T. inerma* Bryant from Cuba, the type species *T. nicoleti* Roewer from Chile, and *T. peckhami* (Bryant) from Cuba. As none of these were found by Wolff (1985), we are confident that the new species described in the current work has never been described before.

METHODS

In the following descriptions, city/town and county records are provided only for *T. hes-*

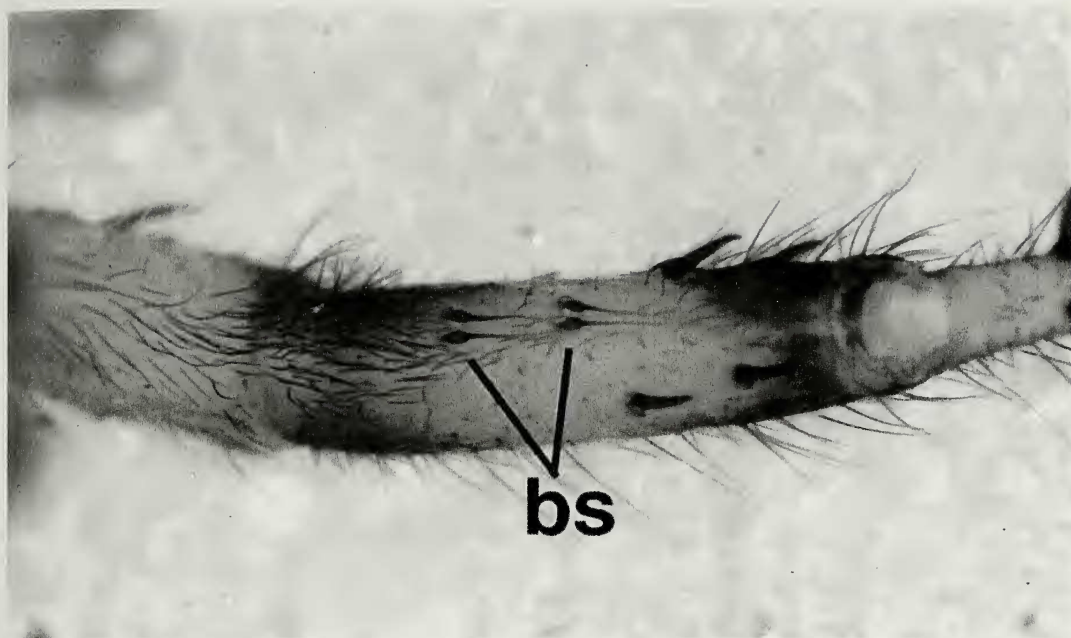


Figure 1.—*Thiodina* sp., left tibia I, ventral view, showing two pairs of bulbous spines (bs). Photograph by R. Vetter.

pera. The other species records for specimens we have examined are listed by counties within the United States. Detailed foreign records for *T. sylvana* and records given by Wolff (1985) are not included. Because *Thiodina* is often found in urban and suburban environments over a wide geographic area, providing more exact locality data seemed superfluous.

The following institutions or collectors loaned material for examination: BCU = Bruce Cutler, University of Kansas; CAS = California Academy of Science, San Francisco; CUAM = Clemson University Arthropod Museum, South Carolina; FAC = Frederick A. Coyle, Western Carolina University, North Carolina; FMNH = Field Museum of Natural History, Chicago; JLK = Jack L. Kaspar, University of Wisconsin-Oshkosh; LAMNH = Los Angeles Museum of Natural History; MCZ = Museum of Comparative Zoology, Harvard University; NMNH = United States National Museum of Natural History; NMSU = New Mexico State University Arthropod Museum; RAB = Richard A. Bradley, Ohio State University-Marion; TRP = Thomas R. Prentice, University of California-Riverside; UCB = University of California-Berkeley, Essig Museum; UCR = University of California-Riverside, Entomology Research Muse-

um; WTAM—West Texas A & M University, Canyon, Texas.

Carapace lengths and widths and total lengths are in millimeters but are listed below without units. Latitude and longitude records for exact localities not recorded by GPS are approximate only and were obtained from the USGS GNIS web site at http://geonames.usgs.gov/pls/gnis/web_query.gnis_web_query_form. No latitude or longitude data were provided for county records for *T. sylvana* and *T. puerpera* as these would be essentially meaningless.

Family Salticidae
Thiodina Simon 1900

Thiodina Simon 1900: 392.
Colonus Cambridge 1901: 246.
Nilakantha Peckham & Peckham 1901: 8–9; Bryant 1950: 202 (nomen nudum; see Platnick 2003).

Type species.—*Thiodina nicoleti* Roewer 1951 (= *Attus elegans* Nicolet 1849, preoccupied by *A. elegans* Hentz 1846) from Chile, female only.

Remarks.—The genus *Thiodina* is distinct among salticid genera found in North America north of Mexico in that members of both sexes, as well as immatures, have two pairs of bulbous spines on the ventral first tibiae (Fig.

Table 1.—Characteristics to distinguish the male *Thiodina* species of the United States. The white scales on the carapace will always appear obvious in fresh specimens and will be unreliable in specimens showing wear. However, in very well-preserved specimens, the scale patterns are diagnostic for species identification. In specimens showing gradation between species for the usually-consistent diagnostic characters, the remaining characteristics will help determine species identification.

	<i>Thiodina sylvana</i>	<i>Thiodina puerpera</i>	<i>Thiodina hespera</i>
Medial white scales on carapace	small, round, restricted to cephalic region between PLE	longitudinal stripe extending posteriorly along declivity	medium, round, extending anterior of PLE
White scales on lateral carapace, ventral to PLE	3+ stripes	patch	3+ stripes
Two longitudinal rows of dorsolateral abdominal white scales	present	present	absent
Fang retromargin teeth	2–3, if one then bicarinate	typically 1, rarely 2	typically 1, rarely 2
Ventral RTA	much thicker basally than at midpoint, taper is readily apparent	thin basally, taper is subtle for entire length	much thicker basally than at midpoint, taper is readily apparent
Tip of ventral RTA	slightly to distinctly sinuate	gentle ventrad curve	slightly to distinctly sinuate
Distribution	eastern half of U.S.A.	eastern half of U.S.A.	southwestern U.S.A. to West Coast

1). Their function is unknown. All also have 2–2 distal ventral spines on the first tibiae. In general, all species are similar in external appearance in that males usually have dark carapaces, with either a white blotch or stripe in the center (Fig. 2) and females have tan carapaces with dark blotches around the eyes (Fig. 4). The male palpi of the three North American species are very similar in morphology with variation overlapping among the species, hence, it is much easier to determine species by the females if examining only genitalia. However, there are sufficient non-genital characters in males that allow accurate species determination when a suite of features is considered (Table 1). Some of these characteristics are difficult to see if the specimen is rubbed or immersed in fluid. The genus ranges from New York, south to Argentina. It is mainly distributed in South America, based on the fact that 11 of the 18 currently recognized species occur in this area. The last published treatment of this genus in the United States was by Peckham and Peckham (1909).

The palps of male *Thiodina* are very similar. With the variation we noticed among the specimens, we found it useful to employ additional non-genital features to confirm spe-

cies determination. The most diagnostic traits for the males were patches of white scales on the carapace (typically present in fresh and well preserved specimens), which alone were sufficient for species determination (Figs. 2, 3). Scales are best observed by removing the spider from alcohol and allowing it to air-dry for a few minutes at which point they become highly conspicuous. However, the scales are easily rubbed off. As a secondary diagnostic structure, retromarginal tooth number is very consistent within each species but occasional specimens have two teeth on one chelicera and one on the other, obfuscating the determination. Due to the intraspecific variation in tooth number, one should examine several characters in determining males. See Table 1 for a list of traits of male characters.

In a review of the phylogeny of the Salticidae, Maddison & Hedin (2003) placed *Thiodina* among the Amycoidea, a group that is largely restricted to the New World.

Excluded species.—The name *Attus iniquus* Walckenaer 1837 was resurrected by Chamberlin and Ivie (1944) as a senior synonym of *T. sylvana*. As Richman (1978) pointed out, there is no certain way to assign this name, which was based on Abbot's (1792)

drawings. Thus Walckenaer's (1837) names for species now included in *Thiodina* are all suspect.

Attus irrorata Walckenaer 1837 was similarly resurrected by Chamberlin and Ivie

(1944) as a senior synonym of *T. puerpera*. Again, Richman (1978) noted that Abbot's 1792 drawings did not allow a conclusion as to the association of this name with *T. puerpera* or *T. sylvana*.

KEY TO SPECIES IN THE UNITED STATES

Three species are known from the United States, *Thiodina sylvana* (Hentz 1846), *T. puerpera* (Hentz 1846) and *T. hespera* new species. They can be separated by the following key.

1. Retrolateral fang furrow usually with 2 or 3 teeth, or if one tooth, then usually bi- or tricuspid *T. sylvana*
Retrolateral fang furrow usually with 1 simple tooth, rarely 2 2
2. Males 3
Females 4
3. In lateral view, basal half of ventral process of RTA does not conspicuously broaden and is only slightly wider than distal half; terminus gently curving ventrad (Fig. 7); carapace with medial longitudinal stripe of white scales (if present—scales easily rubbed off in alcohol specimens) extending posteriorly along declivity toward abdomen (Fig. 2); abdomen with paired longitudinal stripes (Fig. 2) *T. puerpera*
In lateral view, basal half of ventral process of RTA conspicuously broadens and is much wider than distal half, terminus slightly to distinctly sinuate (Fig 8); carapace with medial marking of white scales (if present) always square or rounded, never extending posteriorly along declivity (Fig. 2); abdomen without paired longitudinal stripes (Fig. 2) *T. hespera*
4. Epigynum with transverse ridge distant from epigastric furrow, typically anterior to spermathecae (Fig. 10) *T. puerpera*
Epigynum with transverse ridge close to epigastric furrow, posterior to spermathecae (Fig. 11) *T. hespera*

Thiodina sylvana (Hentz 1846)
Figures 2–3, 5–6, 9, 12

- Attus sylvanus* Hentz 1846: 364, plate 22, fig. 10.
- Attus retiarius* Hentz 1850: 288, plate 10, fig. 11.
- Plexippus puerperus* (Hentz): Peckham & Peckham 1885: 68, plate 2, fig. 5; 1888: 33, plate 1, fig. 23, plate 2, fig. 23, plate 3, fig. 23 (misidentified).
- Colonus puerperus* (Hentz): Cambridge 1901: 246, plate 21, figs. 11, 12 (misidentified).
- Metaphidippus retiarius* (Hentz): Cambridge 1901: 272.
- Thiodina puerpera* (Hentz): Simon 1901: 457 (misidentified).
- Thiodina sylvana* (Hentz): Peckham & Peckham 1909: 449, plate 35, fig. 9; Oehler, 1980: 12, figs. 128–132; Breene et al. 1993: 64, figs. 41A–C.
- Thiodina inquires* (Walckenaer): Chamberlin & Ivie 1944: 216, fig. 11; Kraus, 1955: 59, fig. 169.

(NMNH), Orange County (NMNH), Osceola County (UCR), St. Lucie County (NMNH), Santa Rosa County (BCU); *Georgia*: Rabun County (NMNH), Ware County (NMNH); *Indiana*: Monroe County (FMNH), Park County (FMNH); *Kansas*: Coffey County (BCU), Douglas County (BCU), Elk County (BCU), Johnson County (BCU), Wyandotte County (BCU); *Kentucky*: Whitley County (UCB); *Mississippi*: Lee County (BCU); *Missouri*: Boone County (BCU); *North Carolina*: Macon County (NMNH), Rutherford County (CUAM), Transylvania County (NMNH); *Oklahoma*: Payne County (CUAM); *Ohio*: Delaware County (RAB), Greene County (RAB), Hocking County (RAB), Preble County (RAB); *South Carolina*: Anderson County (CUAM), Oconee County (CUAM), Pickens County (CUAM); *Tennessee*: Blount County (FAC), Campbell County (UCB); *Texas*: Angelina County (BCU), Aransas County (MCZ), Bexar County (CAS), Cameron County (NMNH), Comal County (MCZ), Dallas County (MCZ), Denton County (MCZ), Fairfax County (UCB), Galveston County (MCZ),

Type specimens.—No types of Hentz are known to exist.

Material examined.—U.S.A.: *Alabama*: Winston County (BCU); *Florida*: Alachua County (NMSU), Duval County (UCR), Escambia County (CAS), Highlands County (BCU, NMSU, UCB), Monroe County



Figure 2.—Males of *Thiodina*. Left to right, *T. sylvana*, *T. puerpera*, *T. hespera*. Note the elongate dorsal stripe of cephalic white scales in *T. puerpera* in comparison to a more circular patch in the other species. Also note the lack of paired longitudinal abdominal stripes of white scales in *T. hespera*. Photograph by R. Vetter

Jasper County (BCU), Liberty County (MCZ), San Patricio County (CAS), West County (UCB); Virginia: Essex County (NMNH), Fairfax County (NMNH), Greene County (NMNH); Washington D.C. (NMNH).

Diagnosis.—*Thiodina sylvana* can usually be separated from the other *Thiodina* species in the United States in having two or three retromarginal teeth, or if one tooth, then usually bi- or tricuspid. To confirm determination

of specimens, the medial white scales on the carapace in male *T. sylvana* consist of a much smaller trapezoidal patch between the PLE than in *T. hespera* and does not have the patch drawn into a longitudinal stripe along the declivity as in *T. puerpera* (Fig. 2). In females, lateral pouches (termed by Wolff 1985), internally located at the lateral margins of the epigynal ridge, are about midway between the epigastric furrow and the anterior copulatory



Figure 3.—Males of *Thiodina sylvana* (left) and *T. puerpera*. Note ventral to the PLE, that the white scales consist of 3 stripes in *T. sylvana* and of a solid patch in *T. puerpera*. *T. hespera* also exhibits the striped pattern. Photograph by R. Vetter



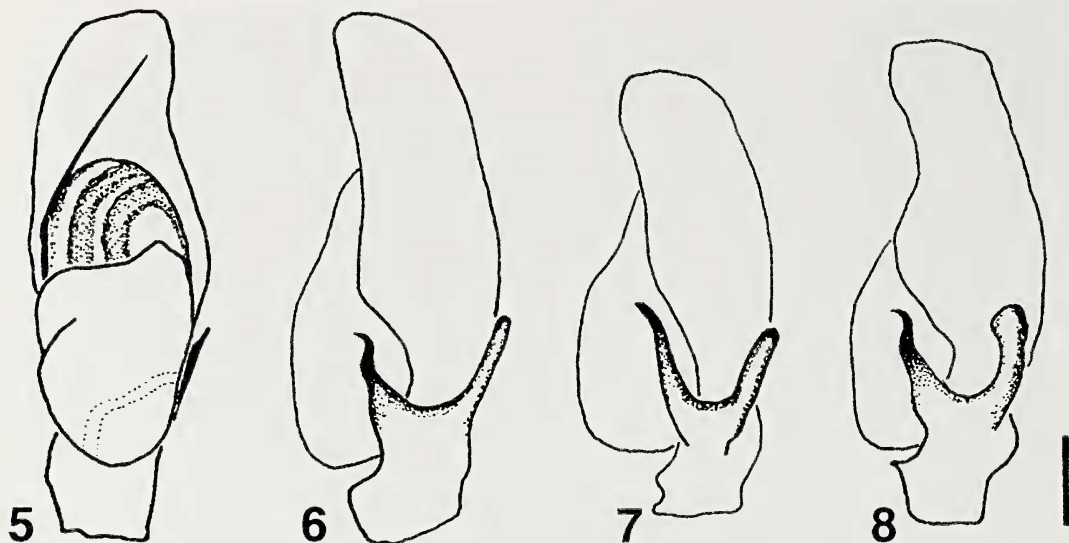
Figure 4.—Female *Thiodina hespera*. Photograph by D. Boe.

openings (Fig. 9), whereas in *T. puerpera*, the pouches are much nearer the copulatory openings (Fig. 10) and in *T. hespera*, they are very close to the epigastric furrow (Fig. 11).

Description.—*Male*: Florida (Highlands County, Archbold Biological Station, 27°10'N, 81°21'W, 30 April 1982, D. Richman, deposited in NMSU). Total length 6.5; carapace length 3.0; carapace width 2.3. PME much closer to ALE than PLE. Leg formula 1432. Carapace orange-brown; scattered black setae; white scales present ventral and anterior to PLE forming remains of probably three undulating longitudinal stripes (specimen partly rubbed); similar scales forming central medium-sized trapezoidal white patch and lateral posterior slash-like marks converging in the direction of the medial patch of scales. PLE surrounded by black pigment; remaining eyes not surrounded by pigment. Clypeus dark. Chelicerae orange-brown; crenulated with dark lateral carinae, four promarginal teeth and one bicuspid retromarginal tooth. Endites yellow-brown with prolateral third nearly white. Labium orange-brown. Sternum yellow-brown. Abdomen

yellowish-gray-brown with curved lateral stripe of white scales containing several dark spots on inside margins on each side of dorsum. First and second legs mostly orange-brown with dark areas prolateral on femora widening toward venter, and on prolateral patellae and tibiae (not widening toward venter); metatarsi and tarsi unmarked. Third and fourth legs unmarked. Pedipalpi orange-brown with darker bulb.

Female: Texas (Dallas, Dallas County, 32°47'N, 96°48'W, August 1935, collected by O. Sanders, deposited in MCZ). Total length 7.4; carapace length 3.3; carapace width 2.5. PME much closer to ALE than PLE. Leg formula 4312. Carapace yellow with scattered black setae, eyes on dark spots. Clypeus yellowish. Chelicerae yellow, with slightly darker fangs, four promarginal teeth and one bicuspid retromarginal tooth. Endites and labium yellow, with anterior ends slightly lighter. Sternum yellow. Abdomen yellowish, with a split central streak and lateral streaks, area between lateral and central streaks speckled with gray spots. All legs yellow, with first



Figures 5—8.—Left male palps of *Thiodina* species: 5. *T. sylvana*, ventral view; 6. Same, retrolateral view; 7. *T. puerpera*, retrolateral view; 8. *T. hespera*, retrolateral view. Scale = 0.2 mm.

and second legs with slightly darker tarsi and metatarsi. Pedipalpi yellow.

Genitalic variation.—In the male, the ventral edge of the ventral RTA varies from straight to undulating and the terminus varies from slightly to distinctly sinuate. Specimens with a slightly sinuate tip may be confused with *T. puerpera* but should be distinguishable by both the degree of basal broadening of the ventral RTA and retromarginal tooth number. In the female, the transverse epigynal ridge typically bisects the spermathecae, however, in a few specimens the ridge almost touches the epigastric furrow as in *T. hespera* or crosses the spermathecae anteriorly as in many *T. puerpera* specimens. Such specimens are difficult to place except by habitat (*T. puerpera* is usually found on grasses) or distribution (*T. hespera* is not likely to be found very far east of the Texas-New Mexico state line and does not seem to overlap *T. sylvana* in any part of its range).

Distribution.—According to Wolff (1985) *T. sylvana* is known from central Texas north to eastern Kansas, east to New York and Florida, south to Panama. Beatty (2002) lists it from both Illinois and Indiana.

Natural history.—Males have been collected from February through November except for August, females from March through December. One female was collected with 30 eggs in June and another with young (not

counted) in July. Usually associated with trees; presumably arboreal. The specific name suggests association with woodland and this generally seems to be the case.

Thiodina puerpera (Hentz 1846)

Figures 2–3, 7, 10, 13

Attus puerperus Hentz 1846: 360, plate 21, fig. 22.
Attus agrestis Peckham & Peckham 1883: 12, plate 1, fig. 9.

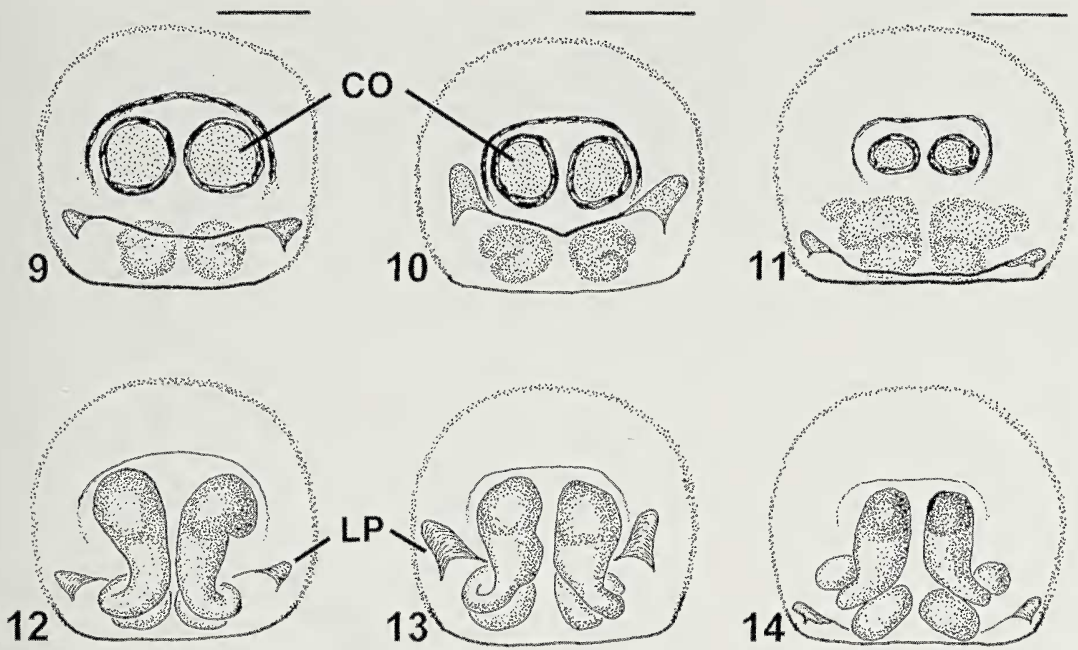
Plexippus puerperus (Hentz): Emerton 1902: 51, figs. 137–139.

Thiodina puerpera (Hentz): Peckham & Peckham 1909: 449, plate 35, fig. 8. Oehler, 1980: 12, figs. 122–127; Breene et al. 1993: 64, figs. 40A–C.

Thiodina irrorata (Walckenaer): Chamberlin & Ivie 1944: 215, fig. 11.

Type specimens.—No types of Hentz are known to exist. The type of *Attus agrestis* is apparently lost, as it appears to not be at the Museum of Comparative Zoology or the Milwaukee Public Museum.

Material examined.—U.S.A.: *Georgia*: Bulloch County (NMNH), Rabun County (NMNH), Ware County (NMNH); *Kansas*: Barber County (BCU), Douglas County (BCU), Ellsworth County (BCU), Greenwood County (NMSU), Harper County (BCU), Johnson County (BCU), Riley County (BCU); *Maryland*: Montgomery County (NMNH); *Missouri*: Ralls County (JLK); *North Carolina*: Craven County (NMNH); *Ohio*: Delaware



Figures 9—14.—Epigyna of *Thiodina* species. Ventral views: 9. *T. sylvana*; 10. *T. puerperal*; 11. *T. hespera*. Dorsal views: 12. *T. sylvana*; 13. *T. puerpera*; 14. *T. hespera*. Scale = 0.2 mm.

County (RAB); *Oklahoma*: Tulsa County (NMSU); *South Carolina*: Greenville County; *Tennessee*: Blount County (FAC); *Texas*: Bexar County (UCB), Brazos County (MCZ), Cameron County (CAS), Comal County (CAS), Denton County (MCZ), Dimmit County (MCZ), Hidalgo County (JLK), Live Oak County (BCU), Potter County (WTAM), Randall County (WTAM), San Patricio County (JLK), West County (UCB).

Diagnosis.—*Thiodina puerpera* typically has one retromarginal tooth which distinguishes it from the often-sympatric *T. sylvana*. *Thiodina puerpera* males have a medial carapace marking usually longitudinally elongated on the declivity, reaching almost to the posterior edge (Fig. 2) and a patch of white scales ventral to the PLE (Fig. 3) whereas the other two species lack medial white scales on the declivity and typically have 3 undulating, longitudinal stripes ventral to the PLE. In worn specimens, diagnosis must be made using genitalic characters. The male of *T. puerpera* has a ventral RTA thin along the entire length with a terminus that curves gently ventrad, never sinuate (Fig. 7) whereas male *T. hespera* and *T. sylvana* have the ventral RTA broad basally, usually with a conspicuously sinuate terminus (Fig. 6, 8). In addition, the

slash-like marks on the carapace are more posterior and not so slanted as in *T. sylvana* and first and second legs less dark than in the other two species. The female epigynum is distinct, where the lateral pouches of the transverse epigynal ridge lie anterior to the spermathecae, resting very close to the copulatory openings (Fig. 10) whereas the pouches are at the midline of the spermathecae in *T. sylvana* (Fig. 9) and just anterior of the epigastric furrow in *T. hespera* (Fig. 11).

Description.—*Male*: Kansas (Fall River, Greenwood County, 37°36'N, 96°01'W, 11 September 1978, collected by W.F. Rapp, deposited in NMSU). Total length 7.2; carapace length 3.0; carapace width 2.4. PME much closer to ALE than PLE. Leg formula 1342. Carapace yellow-brown with scattered black setae; white scales laterad and forming a medial white stripe from just anterior of PLE, posterior to the level of the slash-like white scale patches on the posterior sixth of carapace. Eyes surrounded by black pigment. Carapace with sides bearing solid patch of white scales ventral to PLE. Chelicerae, yellowish-brown, crenulated, with dark lateral carinae, three promarginal teeth and one simple retromarginal tooth. Endites yellow-brown with prolateral third nearly white. Labium and ster-

num yellow-brown. Abdomen yellowish-gray-brown with a curved lateral stripe of white scales on each side of dorsum; these have scattered dark spots, both internally and lateral to the curved white stripes. First and second legs mostly yellow-brown with some dark areas on segments. Third and fourth legs unmarked. Pedipalpi yellow brown, including darker bulb.

Female: Oklahoma (Tulsa, Tulsa County, 36°09'N, 95°59'W, 7 June 1975, collected by J.M. Nelson, deposited in NMSU). Total length 8.4; carapace length 3.2; carapace width 2.6. PME much closer to ALE than PLE. Leg formula 4312. Carapace yellow with scattered black setae and with eyes on dark spots. Clypeus yellowish. Chelicerae yellow, with slightly darker fangs, four promarginal teeth and one simple retromarginal tooth. Endites and labium yellow, with anterior ends very slightly lighter. Sternum yellow. Abdomen yellowish, with scattered black setae and with no markings except vague speckles of gray. All legs yellow; first and second legs with slightly darker tarsi and metatarsi. Pedipalpi yellow.

Genitalic variation.—The genitalia of *T. puerpera* were fairly consistent in structure, much more so than the other two species considered here.

Distribution.—According to Wolff (1985) *T. puerpera* is known from central Texas and southern Oklahoma and eastern Kansas to Pennsylvania and Florida. Beatty (2002) recorded it from Illinois. Records from West Texas A & M University (Canyon, TX) indicate that it is also present in the panhandle of Texas in at least Potter and Randell counties.

Natural history.—Males were collected from February through November; females from February through December except for November. Females with young or egg sac collected in June and October. Usually associated with grassy areas and presumably found primarily on grasses.

Thiodina hespera new species

Figures 2, 4, 8, 11, 14–16

Dendryphantès retarius (Hentz): Banks 1898: 284. (misidentified)

Thiodina retarius (Hentz): Banks 1904: 358. (misidentified)

Thiodina n. sp.: Jung & Roth 1974: 33

Type material.—Holotype female, allotype

male: U.S.A.: *California*: San Diego County, San Diego, Mission Trails Regional Park, Mission Gorge, 32°48'N, 117°04'W, 26 May 1979, D. Boe (AMNH). Paratypes: 3 males, 1 female, same data (CAS).

Other material examined.—U.S.A.: *Arizona*: Cochise County: Chiricahua Mountains, approx. 31°52'N, 109°12'W (NMSU), Portal (Southwest Research Station) N, 31°52'N, 109°12'W (CAS); Maricopa County: Mesa, 33°52'N, 111°49'W (MCZ); Pima County: Santa Catalina Mountains, Molina Basin, 32°20'N, 110°41'W (BCU); Tucson, 32°13'N, 110°55'W (MCZ); Santa Cruz County: Nogales, 31°20'N, 110°56'W (NMNH); *California*: Alameda County: Oakland Hills, 37°48'N, 122°09'W (UCB); Butte County: Oroville, 39°30'N, 121°33'W (UCB); Palermo, 39°26'N, 121°31'W (UCB); Contra Costa County: Lafayette, 37°53'N, 122°07'W (CAS), Mitchell Canyon Park, 37°55'N, 121°57'W (CAS); Fresno County: Auberry, 37°04'N, 119°29'W (CAS); Fresno 36°45'N, 119°47'W (CAS, UCB); Inyo County: Panamint Mountains, Surprise Canyon, 36°45'N, 117°30'W (UCB); Kern County: Kernville, 35°45'N, 118°25'W (JLK); Maricopa, 35°04'N, 119°28'W (CAS); Kings County: Hanford, 36°19'N, 119°38'W (CAS); Los Angeles County: Agoura Hills, 34°10'N, 118°43'W (LAMNH); 15 mi N. Azusa, 34°18'N, 117°51'W (UCR); Glendale, 34°08'N, 118°16'W (LAMNH); Granada Hills, 34°15'N, 118°32'W (LAMNH); Griffith Park, 34°08'N, 118°18'W (LAMNH); La Habra Heights, 33°57'N, 117°57'W (CAS); Los Angeles, 34°02'N, 118°21'W (LAMNH); Monrovia, 34°08'N, 118°01'W (LAMNH); Pasadena, 34°08'N, 118°07'W (LAMNH); San Gabriel, 34°05'N, 118°06'W (LAMNH); South Pasadena, 34°06'N, 118°07'W (LAMNH); Sun Valley, 34°13'N, 118°22'W (LAMNH); Venice, 34°00'N, 118°28'W (LAMNH); West Covina, 34°04'N, 117°56'W (UCR); Whittier, 33°57'N, 118°02'W (LAMNH); Woodland Hills, 34°09'N, 118°38'W (LAMNH, UCR); Madera County: Chowchilla, 37°37'N, 120°16'W (CAS); North Fork, 37°13'N, 119°30'W (CAS); Mendocino County: University of California Hopland Field Station, 39°00'N, 123°05'W (UCB); Monterey County: Arroyo Seco, 36°19'N, 121°16'W (CAS); Cone Mountain 900 m (coordinates not available) (UCR); Hastings Reserve, 36°23'N, 121°33'W (CAS); Napa County: Angwin 400 m, 38°34'N,

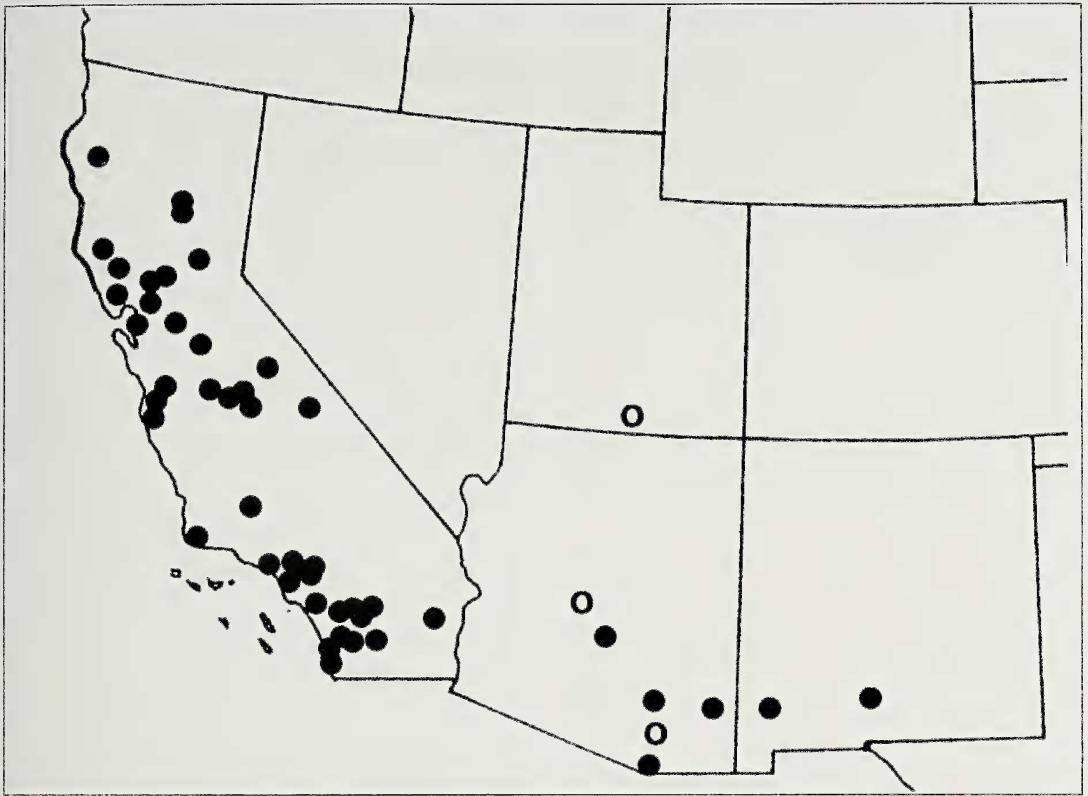


Figure 15.—Distribution of *Thiodina hespera* in the southwestern United States. Solid circles represent localities of spiders examined in this study. Open circles represent published localities of specimens which are probably *T. hespera* because it is the only species of *Thiodina* currently known from the southwestern U.S.A.

122°27'W (CAS); Orange County: Irvine, 33°39'N, 117°49'W (UCR); Riverside County: Banning, 33°55'N, 116°53'W (LAMNH); Bautista Canyon, 900 m, 33°38'N, 116°48'W (TRP); Hemet, 33°45'N, 116°59'W (NMNH); Menifee Valley, 33°40'N, 117°11'W (UCR); Moreno Valley Field Station, 33°55'N, 117°17'W (UCR); Riverside, 330 m, 33°57'06'N, 117°19'31'W (NMSU, NMNH, TRP, UCR); Wiley's Well, 20 km W of Blythe, 33°36'N, 114°54'W (UCR); Sacramento County: Sacramento, 38°34'N, 121°27'W (CAS); San Benito County: Pinnacles, 36°28'N, 121°12'W (CAS); San Diego County: Borrego Valley, 33°00'N, 116°07'W (CAS); Escondido, 33°07'N, 117°05'W (UCB); Indian Flats Campground, 33°21'N, 116°39'W, 1100 m (UCB); La Jolla, 32°50'N, 117°16'W (UCB); Lake Henshaw Dam, 33°14'N, 116°45'W (UCB); Mission Gorge, 32°48'N, 117°04'W (UCR); San Diego, 33°44'N, 117°07'W (CAS); San Diego Bay, 32°48'N, 117°10'W (UCR);

Santa Barbara County: 23 mi W. Santa Barbara, 34°28'N, 120°11'W (UCR); Shasta County (UCR); Sonoma County: Guerneville, 38°30'N, 123°00'W (CAS); Stanislaus County: Del Puerto Canyon at north fork Del Puerto Creek 275–370 m, 37°26'21"N, 121°20'20"W (UCB); Modesto, 37°39'N, 121°00'W (UCB); Tulare County: Ash Mountain 520 m, 36°29'N, 118°50'W (CAS, UCB); Exeter (Lindcove Field Station); 36°17'N, 119°08'W (NMNH); Lindsay, 36°12'N, 119°05'W (NMNH); Visalia, 36°19'N, 119°19'W (NMNH); Yolo County: Davis, 38°33'N, 121°45'W (UCB); Yuba County: Smartville, 39°12'N, 121°17'W (CAS); Spenceville Wildlife Area, 39°07'N, 121°15'W (UCB); *New Mexico*: Doña Ana County: Mesilla Park, 32°16'N, 106°45'W (NMSU); Las Cruces, 32°18'N, 106°46'W (NMSU); Hidalgo County: Animas Mountains, 31°27'N, 108°44'W (NMSU).

Etymology.—The specific epithet signifies

that this species is found in the western United States.

Diagnosis.—A typical member of the genus, with a strong resemblance to *T. sylvana*, both in habitat and especially structure of the male palps. *Thiodina hespera* has one retromarginal tooth and can be separated from most *T. sylvana* which are multi-toothed. Males of *T. hespera* and *T. sylvana* have the ventral RTA thick at base with a slight to distinctly sinuate terminus (Figs. 6, 8) whereas *T. puerpera* has a ventral RTA that is thin basally and a gently curved terminus (Fig. 7). In comparison to *T. sylvana*, specimens of male *T. hespera* have a much larger spot of white scales on the carapace which extends further forward and is bordered by dark blotches surrounding the eyes (Fig. 2). Female epigyna are distinct from the other two species, with the transverse epigynal ridge close to epigastric furrow with visible underlying spermathecae mostly anterior of ridge (Fig. 11). The anterior copulatory openings are relatively much smaller in *T. hespera* (Fig. 11) compared to *T. sylvana* and *T. puerpera* (Figs. 9, 10).

Description.—*Holotype female*: Total length 7.0; carapace length 3.0; carapace width 2.5. PME much closer to ALE than PLE. Leg formula 4312. Carapace orange with scattered black setae; black blotches around eyes and dark central area with small patch of white scales in center of quadrangle formed by ALE and PLE; diverging dark streaks posterior to PLE. Obscure mottling on posterior third of carapace. No dark line around margin of carapace. Clypeus and chelicerae yellowish with fang orange. Chelicerae with three promarginal teeth and one simple retromarginal tooth. Endites light orange with dark fringe of anterior setae. Labium orange. Sternum yellow. Abdomen yellowish with scattered black setae and numerous black dots but no distinct dorsal stripes of white scales. Venter unmarked. Legs generally yellowish with numerous black setae. Pedipalpi yellowish.

Allotype male: Total length 5.6; carapace length 2.4; carapace width 2.1. PME much closer to ALE than PLE. Leg formula 1432. Carapace red-brown with scattered black setae; white scales forming large patch inside ocular quadrangle, with all eyes in large dark blotches, and just posterior and lateral to PLE on each side along the declivity; margin with

dark line. Clypeus dark, with white edge (scales apparently lost) along ventral margin above chelicerae, chelicerae dark chestnut-brown in front, with some iridescence and orange-brown in back; with three promarginal teeth and one simple retromarginal tooth. Endites orange-brown with prolateral 1/3 nearly white. Labium orange-brown. Sternum yellow-brown. Abdomen yellowish with numerous black dots but no distinct dorsal stripes of white scales. Dark grayish leaf-like mark on venter. Legs with first femora almost black; tibiae with brown bands on distal and proximal ends, fainter on last two pairs of legs. Pedipalpi orange-brown with darker bulbs and lighter femora.

Genitalic variation.—Wolff (1985) described the apophyses of the male palpal tibia in *T. hespera* (as *T. sp. A*) as parallel, not divergent as in *T. puerpera* and *T. sylvana*; but we have seen both forms in *T. hespera* from the same locality and hence, it is not a reliable diagnostic character. Additionally, the ventral edge of the ventral process of the RTA of *T. hespera* can either be straight or show a slight undulation and also vary in the curve of its sinuate tip. Females are consistent in their genitalic morphology.

Distribution.—Widely distributed in the western United States, this species is known from New Mexico, Arizona, Utah and California (Fig. 15). Wolff (1985) also had records from western and south central Texas, but we have been unable to confirm these. It is found in Baja California and also probably found in northern mainland of northwestern Mexico. The Banks (1898, 1904) records are almost certainly *T. hespera* although ascribed to *T. sylvana* synonyms.

Natural history.—Mature individuals were collected throughout the year with a peak abundance in May (Fig. 16). Penultimate males were collected in January, March, April, June, August, September and November suggesting that there is little seasonal predictability for maturation. Two August-collected females from Riverside, California laid eggsacs shortly after capture; 20 and 17 spiderlings emerged from these eggsacs with no apparent infertile eggs nor spiderling death. *Thiodina hespera* is often associated with trees and is presumably arboreal; specimens have been recorded from apple trees, in citrus groves, sugarbush (*Rhus ovata*), *Pinus sabi-*

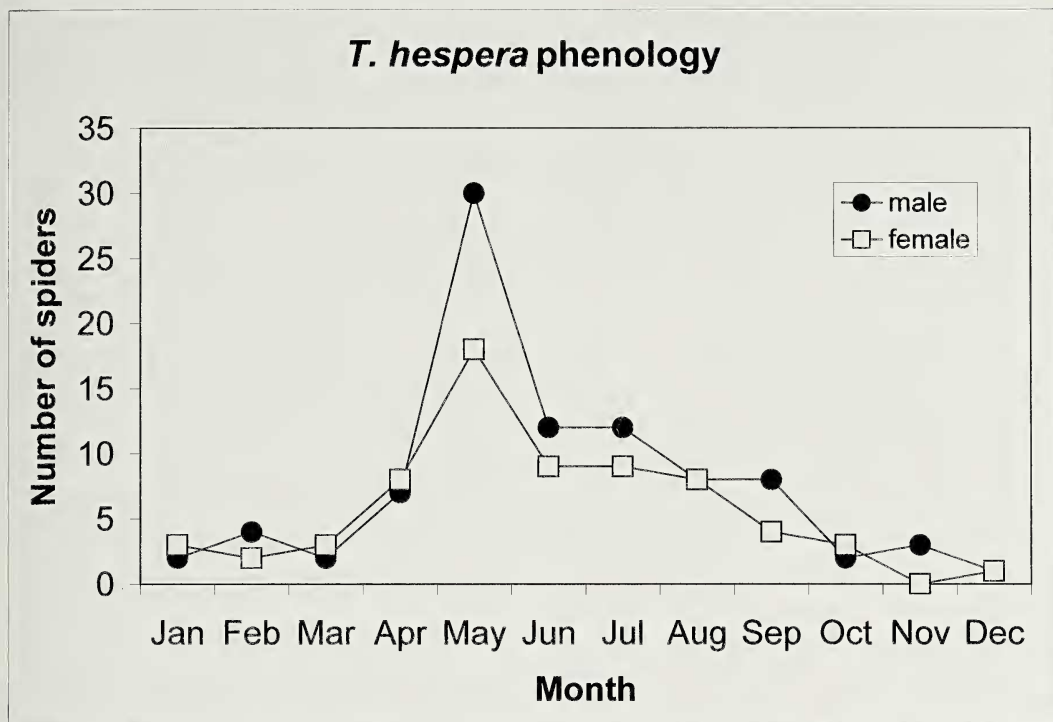


Figure 16.—Phenology of mature specimens of *Thiodina hespera*.

niana and on several species of oak trees, *Quercus* spp. One penultimate male was collected from the mud nest of the pompilid wasp, *Auplopus architectus metallicus*. Most of the collection localities appear to be lowland urban or suburban areas although this may merely reflect the bias of incidental collections. However, *T. hespera* has been taken in a variety of habitats including urban housing in Tucson, San Diego and many cities in the Los Angeles basin, from sea level to elevations of 900–1500+ meters in the Arizona mountains. Specimens have been found in the Kofa and Santa Rita Mountains of Arizona in rocky canyons in association with scattered trees and bushes (D.B.R., pers. obs.).

Carroll (1980) reports life history information for the species in citrus groves in California, stating that it is an abundant species in the canopy and lists insect prey taken by the adult spiders (Diptera: syrphids, muscids, chironomids, empidids; Lepidoptera: tortricids) and by the earliest-instar spiderlings (midges, thrips). In other ecosystems, Carroll (1980) mentions that *Thiodina* spiders also fed on oxypid spiders and exhibited the nocturnal resting behavior of hanging suspended from fo-

liage by a silk thread, which is thought to be an antipredator behavior to avoid night-hunting spiders. One mature female examined by us was collected while feeding on a conspecific subadult. Although the western *Thiodina* species is listed in other faunal surveys, it is a rare member of the spider fauna in ecosystems such as central California vineyards (<1% of total spiders, Costello & Daane 1995) and southern California coastal sage scrub (1 male *Thiodina* out of 14,553 total spider specimens, Prentice et al., 1998). This is a routinely encountered spider on the University of California Riverside campus and in an artificially landscaped Riverside, California apartment structure that is dominated by sycamore, alder and *Eucalyptus* trees (R. S. V., pers. obs.). It is equally common in suburban Las Cruces, New Mexico, where it is often found under or on mulberry trees (D.B.R., pers. obs.).

From faunal surveys in the literature, we add the following presumable *T. hespera* collections due to geography. In Arizona, *Thiodina* specimens are listed as *Dendryphantes retarius* from Madera Canyon, Santa Rita Mountains (Banks 1901), and as *Colonus* re-

tarius from Hot Springs (Banks 1903) [Note: Hot Springs no longer exists but the nearest extant town is Morrystown (Trimble 1986)]. From Kane County, Utah, *Thiodina* specimens are listed as *T. sylvana* from Glen Canyon Reservoir (Chamberlin 1958) and as *Thiodina* sp. from Willow Tank Springs (Allred & Kaston 1983). From Fresno County, California, specimens were collected in Parlier and Reedley (Costello & Daane 1995).

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